IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re: Application of:
Katsuhiko Haji, et al.
Application No.: 09/826,282
Filed: October 4, 1999
For: A GASOLINE ADDITIVE FOR A DIRECT INJECTION GASOLINE ENGINE

Group Art Unit: 1714
Examiner: Cephia D. Toomer

DECLARATION UNDER 37 C.F.R. § 1.132

I, Katsuhiko Haji, declare and state that:

1. I graduated from Yokohama National University, Faculty of Engineering and Department of Organometallic Chemistry and was conferred a master's Degree from the same institute.

I was employed by Nippon Oil Co., Ltd. in 1990. Currently, I am employed by Nippon Mitsubishi Oil Corporation, which is the assignee of the above-identified patent application in their Central Technical Research Laboratory, where I have been actively engaged in the research and development of fuel oils, focusing on particularly additives for gasoline or oils.

2. I am well acquainted with the field of additives for gasoline or oils and therefore conducted experiments described below on behalf of the assignee.

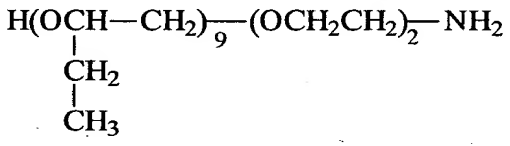
3. I have reviewed the Office Action dated May 21, 2003 (Paper No. 3), in the above-identified application, and a copy of U. S. Patent No. 4,527,996 (Campbell) which the Examiner has used to reject all of the pending claims under 35 U. S. C. §102 (b) and §103 (a). This Declaration has been prepared to address the arguments made by the Examiner in support of his rejections of the claims.

4. It is my understanding that the Examiner is of the position that Campbell teaches a gasoline composition comprising a nitrogen-containing additive, which is represented by the formula defined in claim 13 presently on file, and a fuel composition which controls deposits in internal combustion engines, which include direct injection gasoline engines.

5. In order to overcome the current Examiner's rejection, we amended claim 13 presently on file so as to be directed to a gasoline additive for a direct injection gasoline engine which comprises a nitrogen-containing compound represented by the specific formula wherein "a" is now limited to an integer of from 26 to 30, which range is not specifically disclosed in Campbell. A gasoline composition containing the additive defined in the amended claim can reduce deposits to be formed in the combustion chamber in a direct injection gasoline engine.

6. Furthermore, in order to demonstrate and prove that the claimed gasoline additive is superior in detergency to that disclosed in Campbell, I conducted an additional comparative experiment using a composition obtained by substituting the compound 1 (31a) of the composition used in Inventive Example 1 with the following compound (additive b) disclosed in Campbell, in the same manner as described in the specification.

additive b:



After the engine test was finished, the deposits accumulated in the cavity of the combustion chamber were collected, and then extracted by chloroform. The solution extracted was concentrated, and then was subjected to a measurement using an infrared spectrometer. As a result of the measurement, the ether-bondings originating from the above compound were observed. The results of the engine test are set forth in Table below.

Table

	Composition (mass%)		Engine Evaluation Test Results				
	Base Gasoline	Nitrogen-Containing Compound	Deposits (mg)			THC (g/kg)	Smoke (%)
			Cavity (Inside)	Cavity (Outside)	Cylinder Head		
Example 1	99.98	(31a) 0.02	124	565	825	0.11	4.0
Example 2	99.98	(32a) 0.02	138	580	837	0.11	4.6
Example 5	99.98	(35a) 0.02	133	559	857	0.12	4.6
Comp. Reference Example	99.98	b 0.02	459	635	914	0.17	10.1

31a: Compound 1
32a: Compound 2
35a: Compound 5
b: Compound disclosed in Campbell

7. It is apparent from the results in Table that the gasoline compositions of Inventive Examples 1, 2 and 5 containing additives 31a, 32a, and 35a, respectively, are superior in detergency to the comparative gasoline composition containing additive b disclosed in Campbell.

It has been considered that a detergent cleans deposits through the following mechanism or action:

(1) the polar groups (hydrophilic groups) of the detergent interact with deposits; and then
(2) the oleophillic groups of the detergent dissolve the interacted deposits into the fuel.

As indicated in the above chemical structure of additive b of Campbell, it has nine butylene oxides as the oleophilic group and two ethylene oxides as the hydrophilic group beside the amino group. In view of this fact, it is assumed that the composition of Comparative Example failed to decrease the amounts of deposits for the following reasons:

(a) additive b failed to dissolve deposits into the fuel because the interaction between the hydrophilic groups and deposits in the above

mechanism (1) becomes too stronger, while the oleophillic group in the above mechanism (2) is reduced in dissolubility due to the short chains of the buthylene oxides; and

(b) additive b per se is absorbed to deposits.

As described above, detergents exhibit detergency by well-balancing the ratio of hydrophilic and oleophilic groups. Therefore, in the case where an additive has two ethylene oxides as the hydrophilic group like additive b, it needs to have a large oleophilic group, i.e., the portion of the oleophilic group having longer chain, to enhance the detergency.

8. I declare further that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issuing thereon.

Date: 08/08/2003 Katsuhiko Haji

Katsuhiko Haji